1. The Adams Variable Step-Size Predictor-Corrector Algorithm gives the results in the following tables.

(a)

i	t_i	w_i	h_i	y_i
1	0.04275596	0.00096891	0.04275596	0.00096887
5	0.22491460	0.03529441	0.05389076	0.03529359
12	0.60214994	0.50174348	0.05389076	0.50171761
17	0.81943926	1.45544317	0.04345786	1.45541453
22	0.99830392	3.19605697	0.03577293	3.19602842
26	1.00000000	3.21912776	0.00042395	3.21909932

(b)

i	t_i	w_i	h_i	y_i
1	2.06250000	1.12132350	0.06250000	1.12132353
5	2.31250000	1.55059834	0.06250000	1.55059524
9	2.62471924	2.00923157	0.09360962	2.00922829
13	2.99915773	2.49895243	0.09360962	2.49894707
17	3.00000000	2.50000535	0.00021057	2.50000000

(c)

i	t_i	w_i	h_i	y_i
1	1.06250000	2.18941363	0.06250000	2.18941366
4	1.25000000	2.77892931	0.06250000	2.77892944
8	1.85102559	4.84179835	0.15025640	4.84180141
12	2.00000000	5.38629105	0.03724360	5.38629436

(d)

i	t_i	w_i	h_i	y_i
1	0.06250000	1.06817960	0.06250000	1.06817960
5	0.31250000	1.42861668	0.06250000	1.42861361
10	0.62500000	1.90768386	0.06250000	1.90767015
13	0.81250000	2.08668486	0.06250000	2.08666541
16	1.00000000	2.11800208	0.06250000	2.11797955

2. The Adams Variable Step-Size Predictor-Corrector Algorithm gives the results in the following tables.

(a)

i	t_i	w_i	h_i	y_i
1	1.05000000	1.10385717	0.05000000	1.10385738
2	1.10000000	1.21588587	0.05000000	1.21588635
3	1.15000000	1.33683848	0.05000000	1.33683925
4	1.20000000	1.46756885	0.05000000	1.46756957

(b)

i	t_i	w_i	h_i	y_i
1	0.20000000	0.20120278	0.20000000	0.20120267
2	0.40000000	0.40861919	0.20000000	0.40861896
3	0.60000000	0.62585310	0.20000000	0.62585275
4	0.80000000	0.85397394	0.20000000	0.85396433
5	1.00000000	1.09183759	0.20000000	1.09181825

(c)

i	t_i	w_i	h_i	y_i
5	1.16289739	−1.75426113	0.03257948	−1.75426455
10	1.32579477	−1.60547206	0.03257948	−1.60547731
15	1.57235777	−1.46625721	0.04931260	−1.46626230
20	1.92943707	−1.34978308	0.07694168	−1.34978805
25	2.47170180	−1.25358275	0.11633076	−1.25358804
30	3.00000000	−1.19999513	0.10299186	−1.20000000

(d)

i	t_i	w_i	h_i	y_i
1	0.06250000	1.00583097	0.06250000	1.00583095
5	0.31250000	1.13099427	0.06250000	1.13098105
10	0.62500000	1.40361751	0.06250000	1.40360196
12	0.81250000	1.56515769	0.09375000	1.56514800
14	1.00000000	1.70186884	0.09375000	1.70187005

3. The following tables list representative results from the Adams Variable Step-Size Predictor-Corrector Algorithm.

(a)

i	t_i	w_i	h_i	y_i
5	1.10431651	1.00463041	0.02086330	1.00463045
15	1.31294952	1.03196889	0.02086330	1.03196898
25	1.59408142	1.08714711	0.03122028	1.08714722
35	2.00846205	1.18327922	0.04824992	1.18327937
45	2.66272188	1.34525123	0.07278716	1.34525143
52	3.40193112	1.52940900	0.11107035	1.52940924
57	4.00000000	1.67623887	0.12174963	1.67623914

(b)

i	t_i	w_i	h_i	y_i
5	1.18519603	0.20333499	0.03703921	0.20333497
15	1.55558810	0.73586642	0.03703921	0.73586631
25	1.92598016	1.48072467	0.03703921	1.48072442
35	2.29637222	2.51764797	0.03703921	2.51764743
45	2.65452689	3.92602442	0.03092051	3.92602332
55	2.94341188	5.50206466	0.02584049	5.50206279
61	3.00000000	5.87410206	0.00122679	5.87409998

(c)

i	t_i	w_i	h_i	y_i
5	0.16854008	−1.83303780	0.03370802	−1.83303783
17	0.64833341	−1.42945306	0.05253230	−1.42945304
27	1.06742915	−1.21150951	0.04190957	−1.21150932
41	1.75380240	−1.05819340	0.06681937	−1.05819325
51	2.50124702	−1.01335240	0.07474446	−1.01335258
61	3.00000000	−1.00494507	0.01257155	−1.00494525

(d)

i	t_i	w_i	h_i	y_i
5	0.28548652	0.32153668	0.05709730	0.32153674
15	0.85645955	0.24281066	0.05709730	0.24281095
20	1.35101725	0.15096743	0.09891154	0.15096772
25	1.66282314	0.09815109	0.06236118	0.09815137
29	1.91226786	0.06418555	0.06236118	0.06418579
33	2.00000000	0.05434530	0.02193303	0.05434551

4. Change the following steps:

STEP 1 Set up an algorithm, denoted $RK5$, for the Runge Kutta Method of Order 5.
STEP 3 Call $RK5(h, w_0, t_0, w_1, t_1, w_2, t_2, w_3, t_3, w_4, t_4)$:

Set $NFLAG = 1$;
$i = 5$;
$t = t_4 + h$.

STEP 5 Set

$$WP = w_{i-1} + \frac{h}{720}\Big[1901 f(t_{i-1}, w_{i-1}) - 2774 f(t_{i-2}, w_{i-2}) + 2616 f(t_{i-3}, w_{i-3}) - 1274 f(t_{i-4}, w_{i-4}) + 251 f(t_{i-5}, w_{i-5})\Big];$$

$$WC = w_{i-1} + \frac{h}{720}\Big[251 f(t, WP) + 646 f(t_{i-1}, w_{i-1}) - 264 f(t_{i-2}, w_{i-2}) + 106 f(t_{i-3}, w_{i-3}) - 19 f(t_{i-4}, w_{i-4})\Big];$$

$$\sigma = 27|WC - WP|/(502)h.$$

STEP 8 If $NFLAG = 1$ then for $j = i-4, i-3, i-2, i-1, i$
STEP 12 Set $q = (0.5\,TOL/\sigma)^{\frac{1}{5}}$
STEP 15 If $t_{i-1} + 5h > b$, then set $h = (b - t_{i-1})/5$
STEP 16 Call $RK5(h, w_{i-1}, t_{i-1}, w_i, t_i, w_{i+1}, t_{i+1}, w_{i+2}, t_{i+2}, w_{i+3}, t_{i+3})$;

Set $NFLAG = 1$;
$i = i + 4$.
STEP 17 Set $q = (0.5\,TOL/\sigma)^{\frac{1}{5}}$.
STEP 19 else
if $NFLAG = 1$ then set $i = i - 4$;
Call $RK5(h, w_{i-1}, t_{i-1}, w_i, t_i, w_{i+1}, t_{i+1}, w_{i+2}, t_{i+2}, w_{i+3}, t_{i+3})$;
set $i = i + 4$;
$NFLAG = 1$.

The following are the results obtained by applying the new algorithm to the problems in Exercise 3.

(a)

i	t_i	w_i	h_i	y_i
5	1.17529879	1.01186066	0.03505976	1.01186063
15	1.56737794	1.08139480	0.05580055	1.08139470
25	2.25808774	1.24445586	0.08897663	1.24445574
35	3.51328927	1.55692781	0.14118166	1.55692763
40	4.00000000	1.67623932	0.09734215	1.67623914

(b)

i	t_i	w_i	h_i	y_i
5	1.33993400	0.40368020	0.06798680	0.40368021
15	2.13987639	2.03689764	0.07343117	2.03689764
25	2.78633514	4.58497685	0.05029339	4.58497677
30	2.99000695	5.80662141	0.00249826	5.80662127
34	3.00000000	5.87410012	0.00249826	5.87409998

(c)

i	t_i	w_i	h_i	y_i
5	0.32371968	−1.68713369	0.06474394	−1.68713361
15	0.98679855	−1.24400623	0.08248419	−1.24400610
20	1.39921950	−1.11481699	0.08248419	−1.11481718
25	1.81164045	−1.05200140	0.08248419	−1.05200171
29	2.23962447	−1.02242929	0.13150782	−1.02242946
33	2.76565574	−1.00789049	0.13150782	−1.00789033
39	3.00000000	−1.00494544	0.02056729	−1.00494525

(d)

i	t_i	w_i	h_i	y_i
5	0.49509708	0.29938376	0.09901942	0.29938377
15	1.27560008	0.16486635	0.03572768	0.16486623
20	1.65480865	0.09938119	0.10258441	0.09938111
25	1.94399098	0.06049879	0.02800451	0.06049858
27	2.00000000	0.05434569	0.02800451	0.05434551

5. The current after 2 seconds is approximately $i(2) = 8.693$ amperes.